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434 MHz RF Amplifier for RKE using the NSVF5501SK



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Overview

This application note explains about ON Semiconductor's NSVF5501SK which is used as a Low Noise Amplifier (LNA) for RKE (Remote Keyless Entry).

The NSVF5501SK is a silicon bipolar transistor best suited for high-frequency applications which is assembled in the 3-pin surface mount package.

For information about the performance, please refer to the datasheet of this product.

Since the evaluation board is adjusted to achieve optimal performance in RKE (434 MHz), the product can provide 12.1 dB gain.

A standard material FR4 is used for the printed circuit board (PCB). Please note that the losses of the PCB and the SMA connector are not excluded from the noise figure.

APPLICATION NOTE

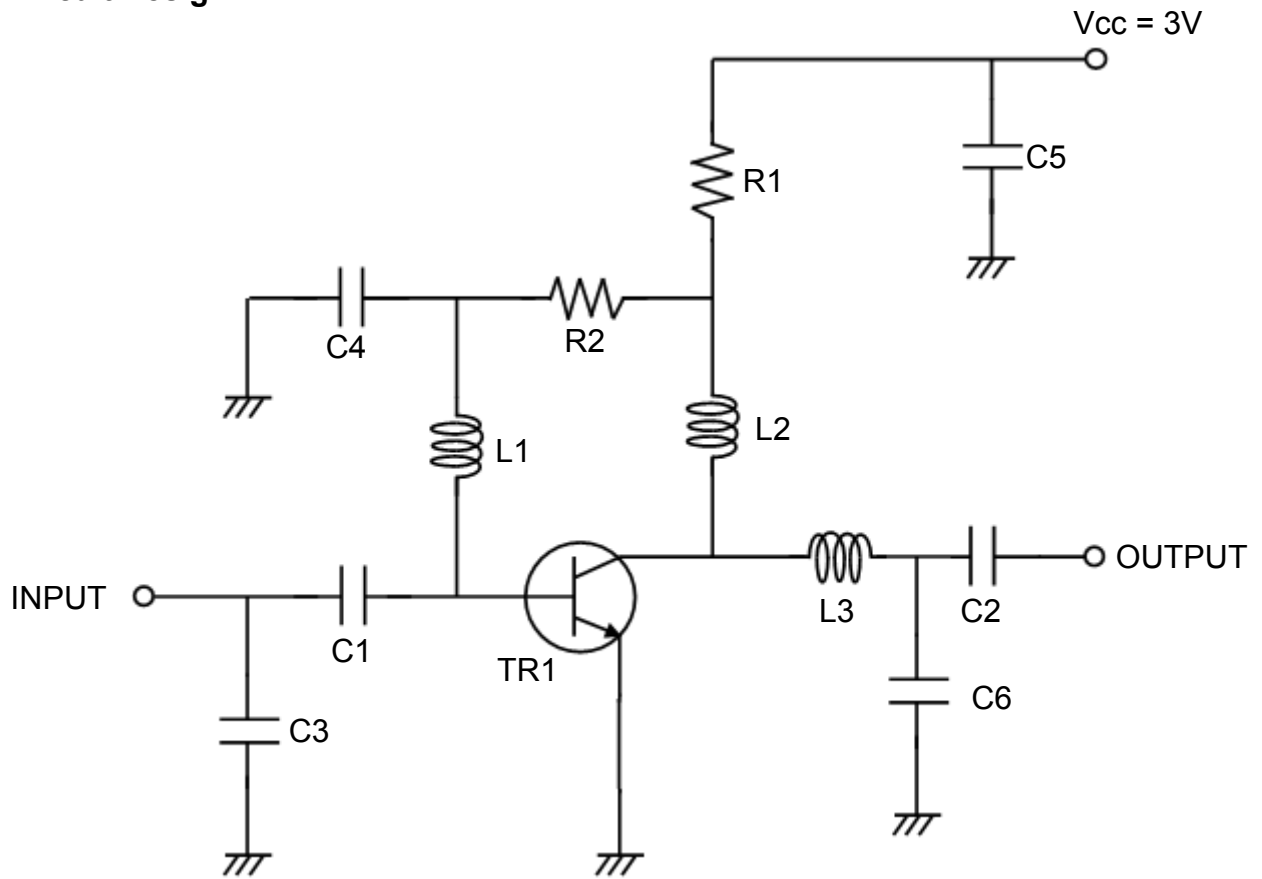
■ Summary of Data

Ta = 25°C, Input Power = -40 dBm

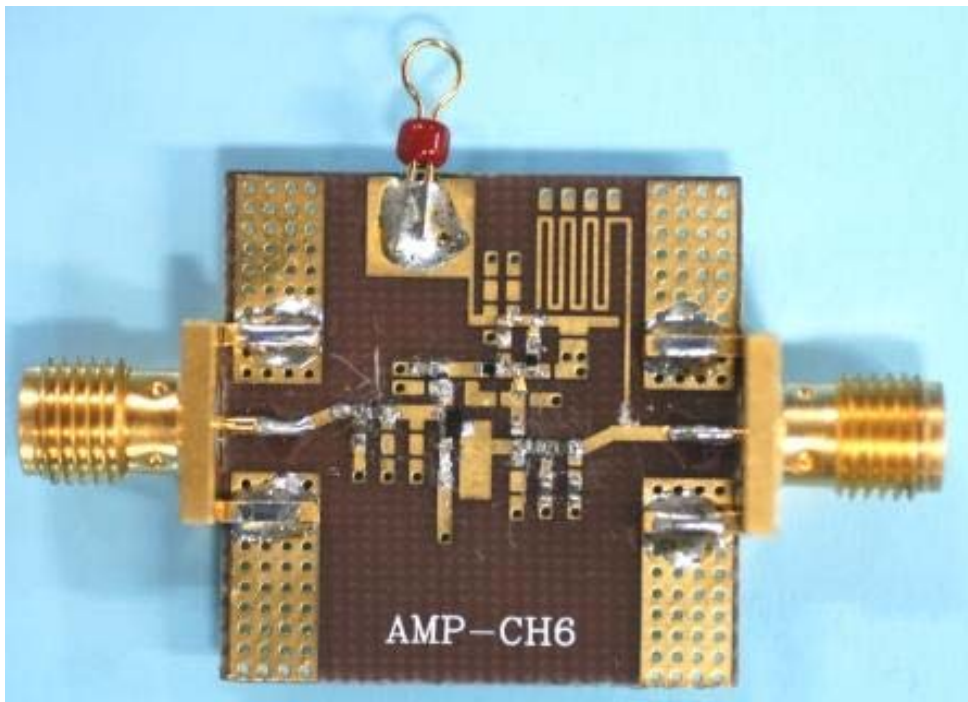
Parameter	Symbol	Condition	Result	Unit
DC Voltage	Vcc		3.0	V
DC Current	Icc		1.87	mA
Power Gain	Gp	f = 434 MHz	12.1	dB
Noise Figure	NF	f = 434 MHz	3.25	dB
Input Return Loss	RLin	f = 434 MHz	16.1	dB
Output Return Loss	RLout	f = 434 MHz	15.1	dB
Isolation	ISL	f = 434 MHz	15.9	dB
Gain 1 dB Compression Input Power	Pin1dB	f = 434 MHz	-22.0	dBm
Input 3rd Order Intercept Point	IIP3	f1 = 433 MHz f2 = 434 MHz Pin = -35 dBm	-13.3	dBm

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■ Circuit Design



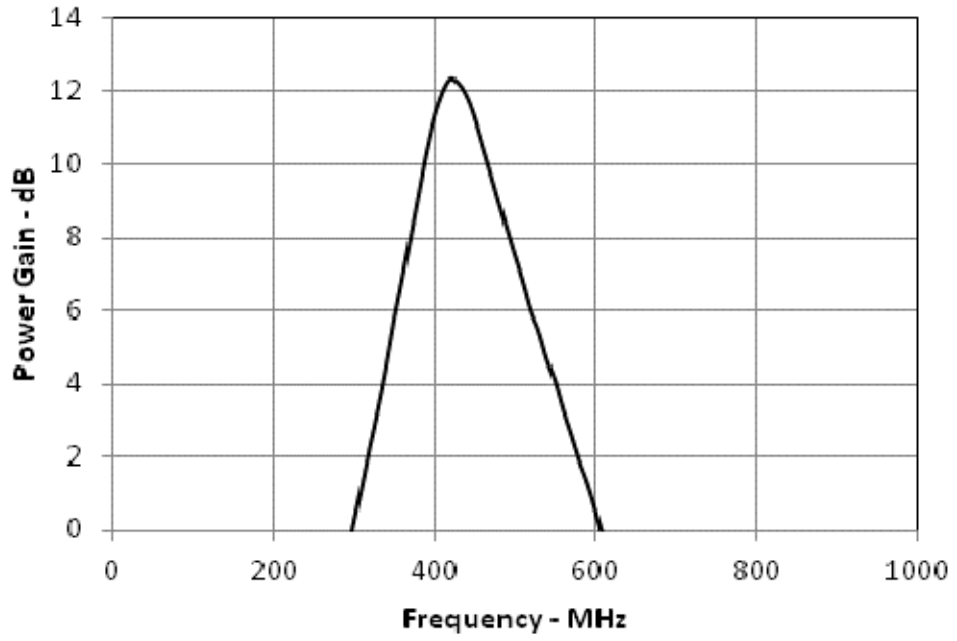
■ Evaluation Board



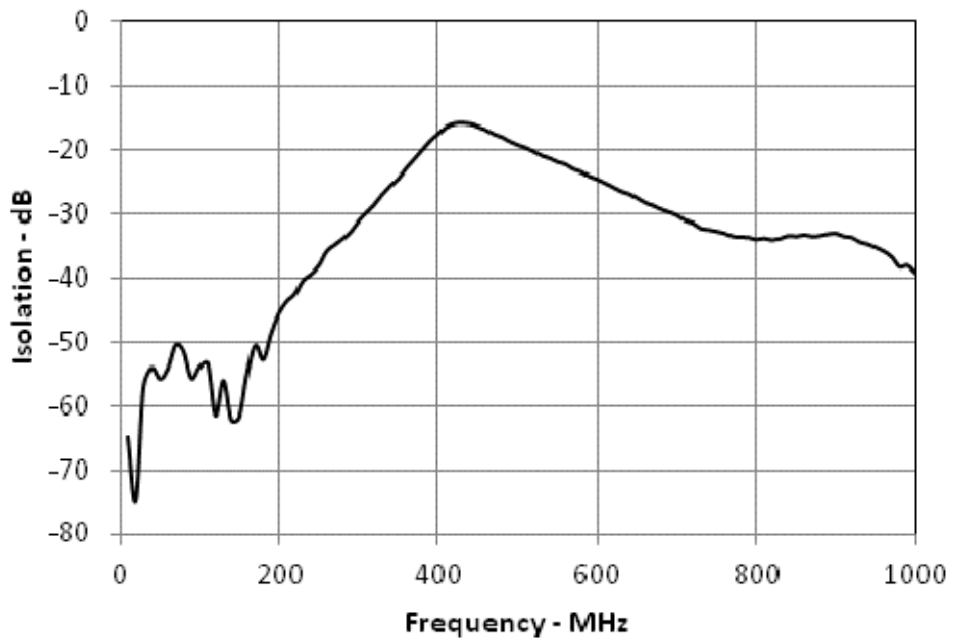
■ Bill of Materials

Item	Symbol	Value	Manufacturer	Size
Bip-Tr	TR1	NSVF5501SK	ON Semiconductor	SC81
Capacitor	C1	68 pF	Murata GRM155	1005
	C2	6 pF	Murata GRM155	1005
	C3	15 pF	Murata GRM155	1005
	C4	220 pF	Murata GRM155	1005
	C5	0.1 μ F	Murata GRM155	1005
	C6	2 pF	Murata GRM155	
Resistor	R1	680 Ω	Various	1005
	R2	68 k Ω	Various	1005
Inductor	L1	4.7 nH	Toko LL100-FHL	1005
	L2	39 nH	Toko LL100-FHL	1005
	L3	39 nH	Toko LL100-FHL	1005
Material	–	FR4	–	25 x 25 mm

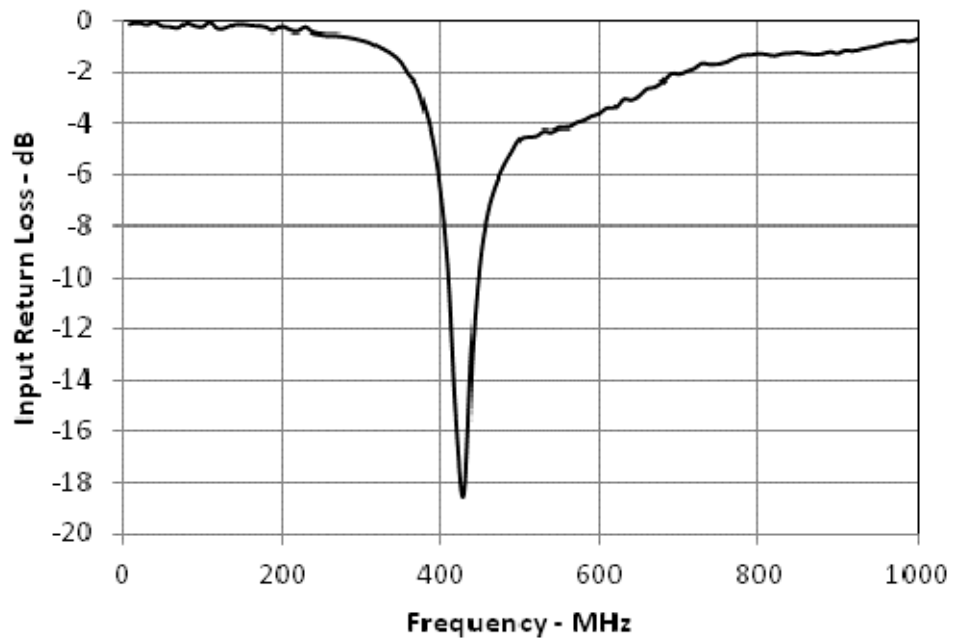
■ Power Gain



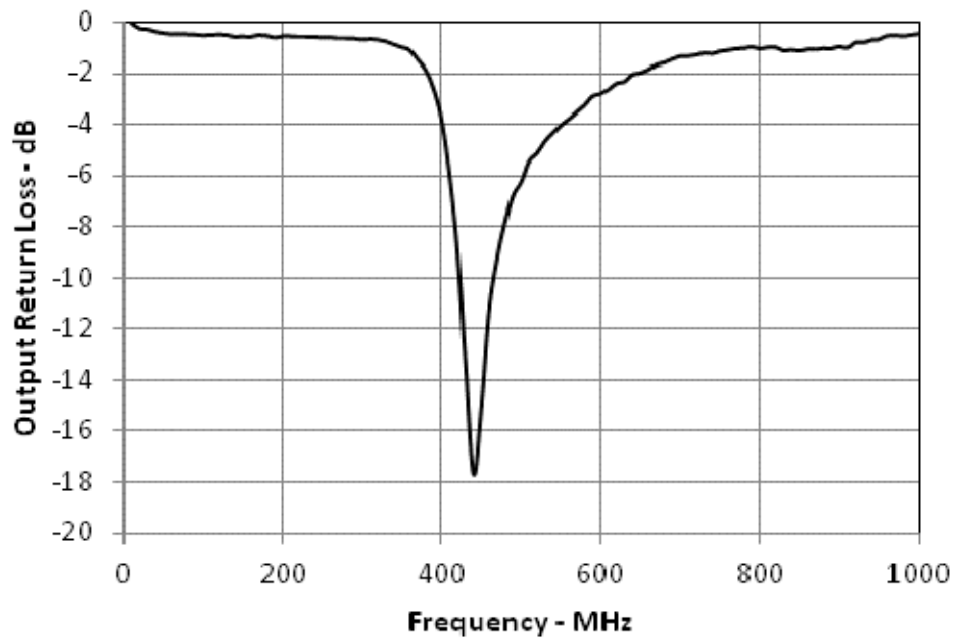
■ Isolation



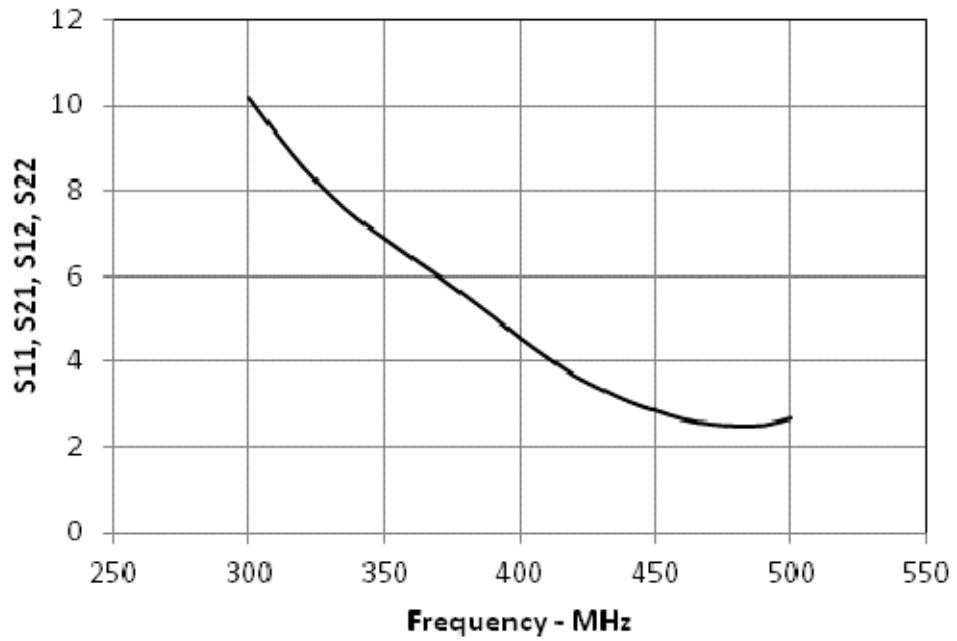
■ Input Return Loss



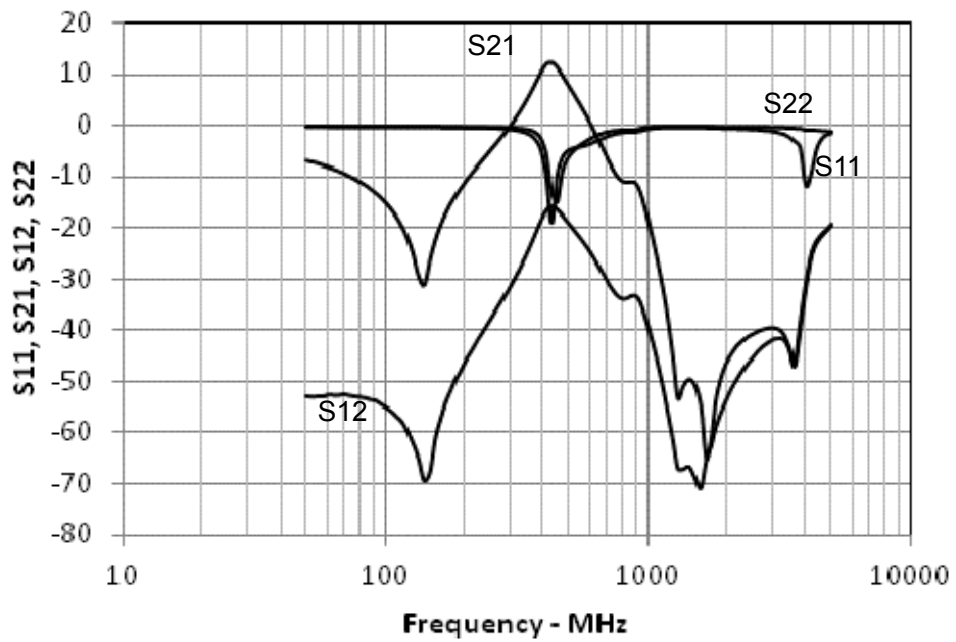
■ Output Return Loss



■ Noise Figure

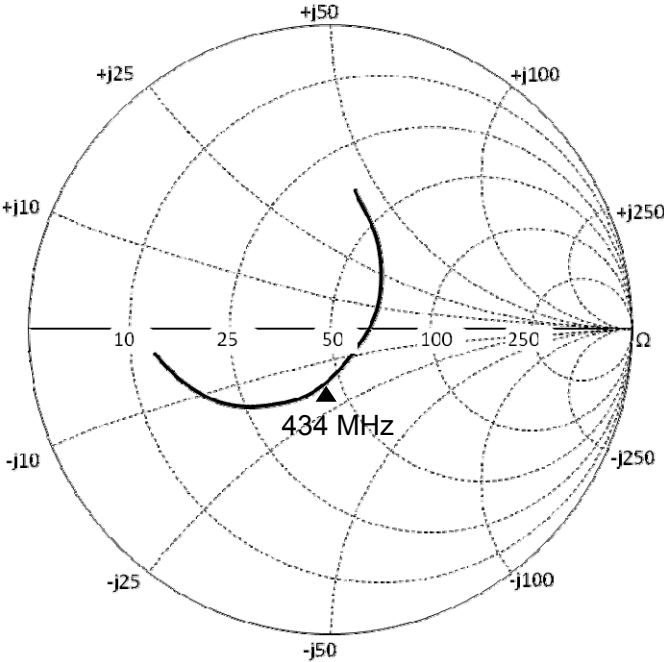


■ S11, S21, S12, S22 Wide Span



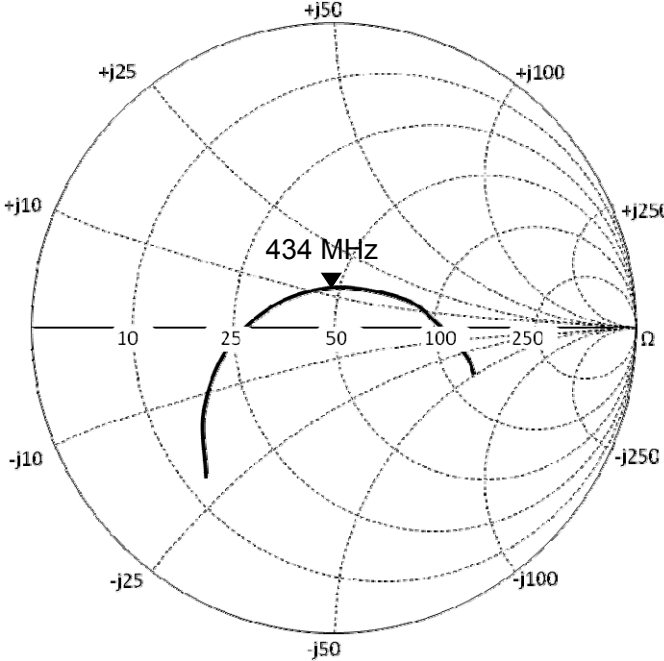
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■ Smith Chart Input Return Loss



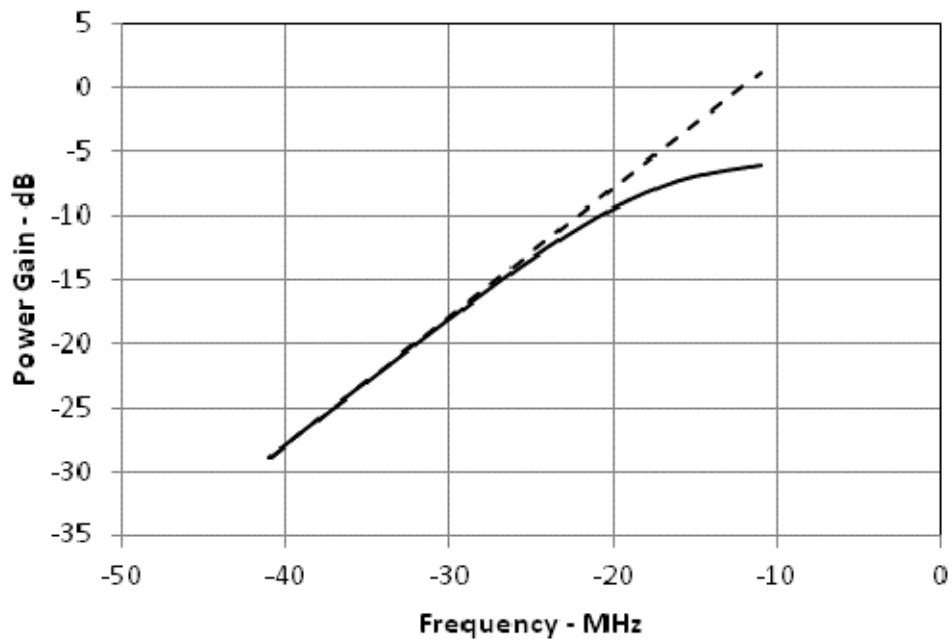
400 MHz to 500 MHz

■ Smith Chart Output Return Loss



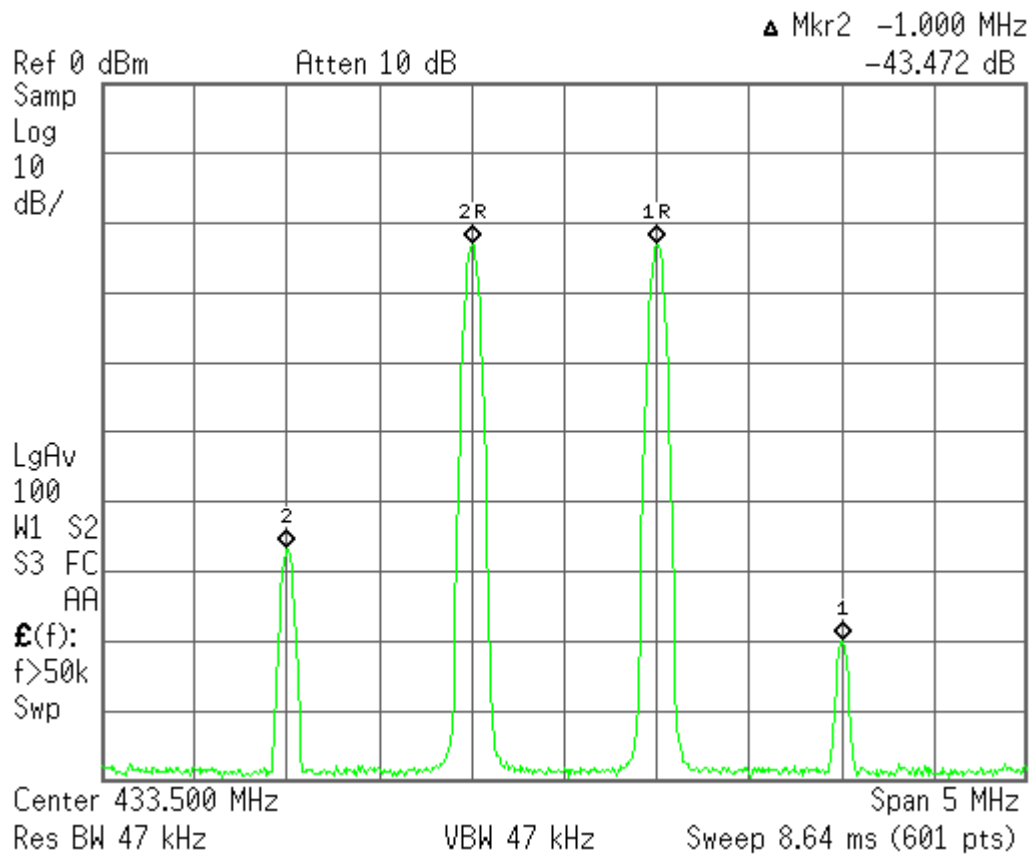
400 MHz to 500 MHz

■ Gain 1 dB Compression Point



■ Input 3rd Order Intercept Point

f1 = 433 MHz, f2 = 434 MHz, Pin = -35 dBm



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